

APPENDIX F
INSTRUMENT LOOP DIAGRAMS GUIDANCE
(PROGRAMMATIC AND FACILITY)

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1.0 PURPOSE AND SCOPE

Application of ISA-5.4-1991, Instrument Loop Diagrams is required for safety-related instrumentation systems (ESM Chapter 8 Section 3.4). This appendix provides additional guidance in the preparation and use of instrument loop diagrams. For examples, refer to the ISA standard.

2.0 DEFINITIONS

Instrument Loop Diagram – An engineering drawing which symbolically represents a single control loop identifying control components and interconnections. Special situations may necessitate a combination of loops on one drawing. A loop diagram may document electrical or pneumatic instruments or a combination of both.

P&ID – Process and Instrumentation Diagram.

3.0 DIAGRAM FORMAT AND LAYOUT

- A. Size of Drawing: Loop diagrams should be prepared as 11-inch × 17-inch drawings. The smallest letter size should not be less than 1/8-inch.
- B. The loop diagram will generally contain only one loop. Special situations may necessitate a combination of loops on one drawing. The drawing should be arranged to prevent congestion and should provide extra space for future revisions. Complex loops that require more than one sheet may be expanded to as many 11" × 17" sheets as necessary. Adequate continuation points should be provided for proper understanding of the total loop configuration.

4.0 DIAGRAM CONTENT

- A. All components should be clearly labeled and uniquely identified.
- B. All components of the loop and the loop itself, including connections to multi-point and trend recorders and computers, should be identified (all instrument numbers should agree with the P&ID).
- C. The loop diagram should include word descriptions of loop functions. The title should be adequate, but if not, supplemental notes should be added. Descriptions of special functions and features that are not obvious, especially safety and shutdown circuits, should be given. All interconnections with electrical cables, conductor pairs, pneumatic multi tubes, and individual pneumatic and hydraulic tubing should be shown (this includes junction boxes, terminals, bulkheads, ports, and computer input/output, such as I/O connections, grounding systems, grounding connections, and signal levels). All interconnections should be uniquely identified and clearly labeled.
- D. The location of devices should be identified using descriptors such as field, panel front, panel rear, auxiliary equipment, rack, and termination cabinet.

- E. Electrical power, air and hydraulic supplies, including the designated voltage and pressure values, should be shown.
- F. The process lines and equipment should be sufficient to describe the process side of the loop and clarify the control action. Provide the process variable being measured and what is being controlled.
- G. Supplemental drawings and records should be referenced to show interrelations with other control loops, such as overrides, interlocks, cascades, and shutdowns.
- H. Although loop design often requires input from several different design areas, design responsibility and configuration control of the loop should be centered within a single function, such as the I&C group or Design Authority.
- I. Descriptions should be given for controller action, control valve action, control valve fail-safe action (electronic and/or pneumatic failure), and solenoid valve action.
- J. Calibration information should be shown in consistent units.
- K. Unique identification numbers consistent with other record documents should be shown for equipment such as racks, panels, and junction boxes.

5.0 DIAGRAM SYMBOLS

- A. Symbols used in instrument loop diagrams are provided in ANSI/ISA-5.1-1984, Instrumentation Symbols and Identification, and ISA-5.3-1983, Graphic Symbols for Distributed Control / Shared Display Instrumentation, Logic and Computer Systems.